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RECORD OF DECISION UNEXPLODED ORDNANCE 1 (UXO 1) EASTERN CONSERVATION
AREA ATLANTIC FLEET WEAPONS TRAINING AREA FORMER VIEQUES NAVAL TRAINING
RANGE (ENGLISH VERSION) VIEQUES ISLAND PUERTO RICO

11/01/2015
CH2M HILL



Record of Decision

UXO 1, Eastern Conservation Area

Atlantic Fleet Weapons Training Area – Vieques

Former Vieques Naval Training Range

Vieques, Puerto Rico
November 2015

1 Declaration

1.1 Site Name and Location

This Record of Decision (ROD¹) documents the selected remedy for UXO 1, Eastern Conservation Area (ECA), located at the Former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico. The former VNTR is part of the Atlantic Fleet Weapons Training Area-Vieques, which was placed on the National Priorities List (NPL) on February 11, 2005 (Comprehensive Environmental Response, Compensation, and Liability Information System [CERCLIS] National Superfund database identification number: PRN000204694). UXO 1 is also known as Operable Unit (OU) 18 in the CERCLIS database.

1.2 Statement of Basis and Purpose

The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The United States (U.S.) Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Atlantic, U.S. Environmental Protection Agency (EPA) Region 2, Puerto Rico Environmental Quality Board (PREQB), and the Department of Interior (DOI) entered into a Federal Facilities Agreement (FFA) for the former VNTR in 2007, as a result of the NPL listing and pursuant to CERCLA. The FFA establishes the procedural framework and schedule for implementing the CERCLA response actions for Vieques. The Navy is the lead agency and responsible for ensuring the appropriate CERCLA response alternatives are developed and implemented as necessary to protect public health, welfare, and the environment.

This remedy is being jointly selected by the Navy and EPA, with concurrence of DOI and PREQB. This decision is based on information contained in the Administrative Record file for this remedy. Information not specifically summarized in this ROD or its references, but contained in the Administrative Record, has been considered and is relevant to the remedy selection at UXO 1. Thus, the ROD is based upon and relies on those portions of the Administrative Record file that pertain to UXO 1 in making this decision. This ROD is presented in a format that is conducive for the general public to read and understand the information upon which the decision for UXO 1 was made, while providing links to the technical details presented in the Administrative Record.

1.3 Scope and Role of Response Action

Based on investigations conducted, no unacceptable human health or ecological risks were identified from potential exposure to contaminants at UXO 1. However, although surface munitions and explosives of concern (MEC) were removed across the vast majority of the site during interim removal actions, there is the potential for MEC to be present in areas where it was not previously removed or where it becomes exposed from erosion. Therefore, the selected remedy will address the potential explosive hazards posed by MEC that may remain at the site.

¹ This acronym, and all the others used in this document, can be found in alphabetical order at the end of this document.

UXO 1 is one of 18 munitions response sites within the former VNTR having been or currently being evaluated in accordance with CERCLA under the Navy's Munitions Response Program (MRP). The Site Management Plan (SMP) for Vieques further details the investigation history and the schedule for CERCLA investigations/remediation activities at the former VNTR and is updated annually. The response action selected in this ROD is intended to be the final remedy for UXO 1 and does not include or affect any other sites at the former VNTR under the CERCLA process. The final determinations for the other sites within the former VNTR have been documented in past decision documents or will be documented in future decision documents.

1.4 Description of Selected Remedy

The selected remedy for UXO 1 is Focused Additional MEC Removal and Land Use Controls (LUCs). This remedy reduces explosive hazards by reducing the potential for uncontrolled human contact with MEC potentially present in site soil and the lagoon, ensuring land use controls are in place consistent with the property being part of the National Wildlife Refuge.

The components of the selected remedy are:

- Focused additional MEC removal
- Physical demarcation and institutional controls (ICs)
- Long-term monitoring (LTM) and operations and maintenance (O&M)

1.5 Statutory Determination

The selected remedy for UXO 1 meets the statutory requirements of CERCLA Section 121 and is protective of human health and the environment, complies with Federal and Commonwealth regulations that are applicable or relevant and appropriate to the remedial action, and is cost-effective. Because MEC posing explosive hazards may remain at the site following implementation of the remedial action, the Navy will conduct statutory reviews every five years to ensure that the remedy remains protective of human health and the environment.

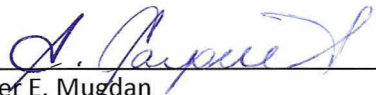
1.6 Navy Authorizing Signature for the Record of Decision for UXO 1,
Atlantic Fleet Weapons Training Area – Vieques



J. R. Cirvello
Environmental Business Line Manager
Naval Facilities Engineering Command, Atlantic

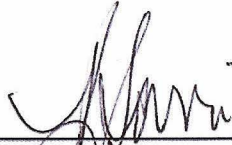
21 Aug 2015
Date

1.7 EPA Authorizing Signature for the Record of Decision for UXO 1,
Atlantic Fleet Weapons Training Area - Vieques


Walter E. Mugdan
Director, Emergency and Remedial Response Division
Environmental Protection Agency, Region 2

11.4.15
Date

**1.8 DOI Concurrence Signature for the Record of Decision for UXO 1,
Atlantic Fleet Weapons Training Area – Vieques**



Kristen J. Sarri

Principal Deputy Assistant Secretary, Policy, Management and Budget
Department of Interior

10/28/15

Date

1.9 PREQB Concurrence Signature for the Record of Decision for UXO 1,
Atlantic Fleet Weapons Training Area – Vieques



Welton F. Ortiz Franco
Executive Director
Puerto Rico Environmental Quality Board

July 21, 2015
Date

2 Decision Summary

2.1 Site Description and History

Vieques is approximately seven miles southeast of the eastern tip of the main island of Puerto Rico (**Figure 1**). Besides Mainland Puerto Rico, Vieques is the largest island in the Commonwealth of Puerto Rico, encompassing 33,088 acres.

The Navy purchased large portions of Vieques in the early 1940s to conduct activities related to military training. Operations within the Former Naval Ammunition Support Detachment (NASD) (western third of Vieques) consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and some training. Operations within the Former VNTR (eastern half of Vieques), where UXO 1 is located, comprised various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities at Camp Garcia. The VNTR is approximately 14,600 acres and comprises the Eastern Maneuver Area (EMA), Surface Impact Area (SIA), Live Impact Area (LIA), and ECA (**Figure 2**).

The Navy ceased training exercises at the Former VNTR on April 30, 2003, in accordance with the Presidential Directive to the Secretary of Defense dated January 30, 2000, and the land was transferred to the DOI, to be managed by the United States Fish and Wildlife Service (USFWS) as a National Wildlife Refuge and the Navy has had no military presence at the main operational area since. Currently, the Navy's involvement at the former VNTR comprises the environmental restoration program activities.

UXO 1 is approximately 133 acres in size and located along the easternmost portion of Vieques within the Former VNTR. UXO 1 was established as a conservation area in 1983 and not used as an operational area for munitions; however, the site is located adjacent to the LIA where former artillery and air-to-ground bombing targets and open burning/open detonation (OB/OD) activities were located. MEC identified in UXO 1 were most likely a result of missing intended targets and from OB/OD activities in the adjacent LIA.

FIGURE 1
Regional Location Map

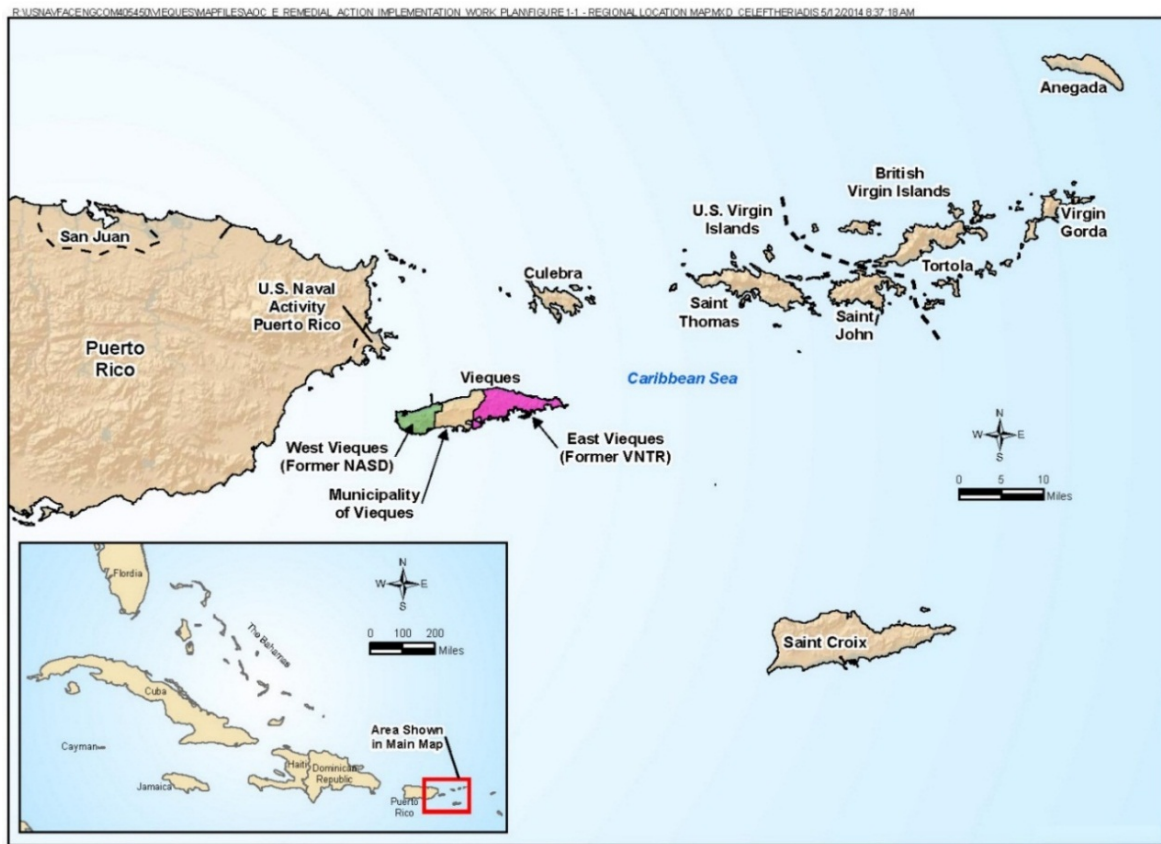
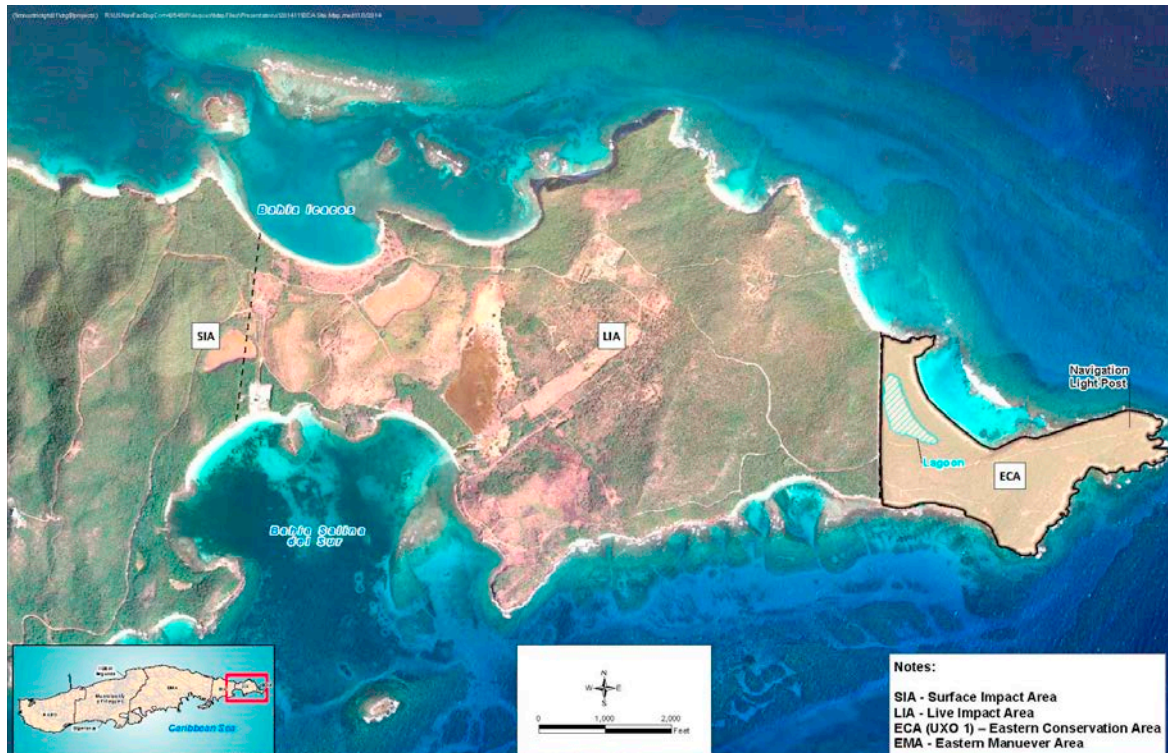


FIGURE 2
Former VNTR and UXO 1 Location Map



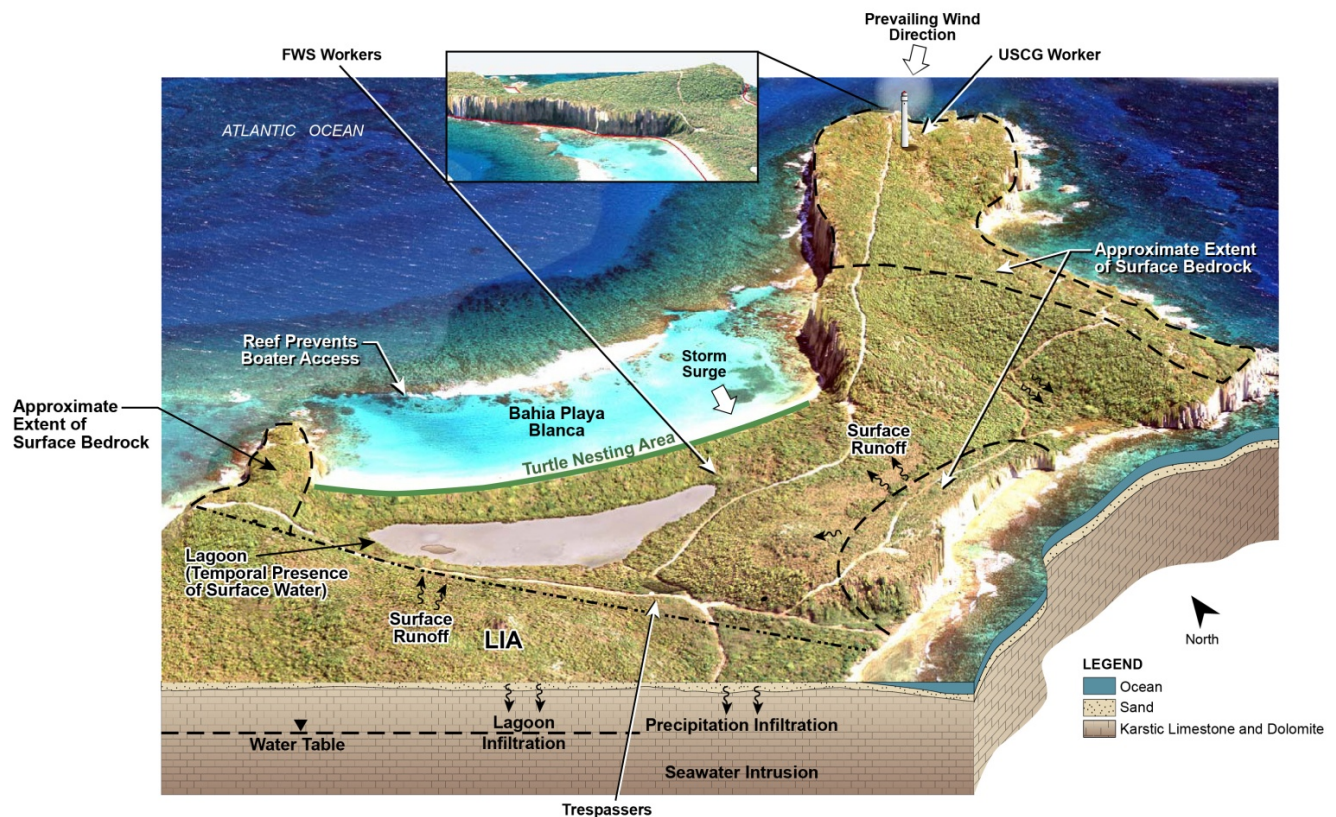
2.2 Site Characteristics

The northern, eastern, and southwestern portions of UXO 1 are topographically high areas (up to 60 feet above mean sea level [ft msl]) that slope toward an inland lagoon and the ocean, as shown in **Figure 3**. Large cliff faces separate the ocean from the land, except at Bahia Playa Blanca. A nine-acre inland lagoon is located within the western portion of the site; the lagoon is not tidally influenced and observations of the temporal presences of surface water suggest it is wholly or mostly the result of precipitation. No streams occur within UXO 1.

The site is relatively undisturbed and provides suitable terrestrial habitat for a variety of plant, invertebrate, reptile, bird, and mammal communities. The beach along Bahia Playa Blanca serves as a sea turtle nesting area. The dominant vegetation type is low-growing, mostly native evergreen scrub along the eastern, southern, and northwestern portions of UXO 1. The large, low-lying area southwest of Bahia Playa Blanca contains an inland lagoon and supports an extensive forested scrub community with a greater abundance of invasive plant species, though mangroves occur along the narrow lagoon fringe.

The geology of UXO 1 is characterized as limestone, either near or exposed at the ground surface, and beach sand at Bahia Playa Blanca. The upland areas generally contain bedrock exposed at the surface, with a very thin layer of soil in some locations. Within the lowland areas, beach sands intermixed with limestone are encountered at the surface. Groundwater within UXO 1 primarily occurs within the bedrock and is likely influenced by seawater.

FIGURE 3
Conceptual Site Model



2.3 Previous Investigations

Environmental investigations at UXO 1 were initiated with an Environmental Baseline Survey in 2000. Subsequently, a Preliminary Range Assessment, an Expanded Range Assessment/Site Inspection (ERA/SI),

Time Critical Removal Action (TCRA), Non-Time Critical Removal Action (NTCRA), Remedial Investigation (RI), and a Feasibility Study (FS) were conducted. **Table 1** summarizes all previous removals, investigations, and studies performed at UXO 1.

TABLE 1
Previous Investigations

Previous Investigation*	Date	Investigation Activities
Environmental Baseline Survey	2003	An Environmental Baseline Survey ¹ (NAVFAC) was completed in 2003 to disclose information regarding the environmental condition of the Navy property. The information was used as a basis for determining the environmental suitability of the property for transfer.
Preliminary Range Assessment	2002	The Preliminary Range Assessment ² (CH2M HILL, 2003) was conducted in 2002 to provide information about the types, quantities, and other factors related to the military munitions used, and to identify the types and locations of any targets that may have been used at the VNTR. The information was used to help identify areas for further consideration.
Expanded Range Assessment/Site Inspection	2005-2008	The ERA/SI was conducted from 2005 through 2008 to determine the presence of and estimate the quantity of munitions at 17 UXO sites within the former VNTR (CH2M HILL, 2010). Activities within UXO 1 included a handheld magnetometer survey along beaches that identified subsurface anomalies, an aerial light detection and radar (LIDAR) survey that used orthophotography to identify craters, and an aerial magnetometer survey to identify elevated anomaly density areas. The ERA/SI resulted in the identification of munitions ³ within UXO 1.
Time Critical Removal Action	2005-2009	A TCRA ⁴ was conducted from 2005 through 2009 to remove MEC present or exposed on the ground surface in accessible areas within both the LIA and ECA (CH2M HILL, 2010). MEC was removed from the surface within 125 acres of UXO 1 including the lagoon, leaving only several acres of steep slopes and cliff edges not cleared, primarily because of inaccessibility and instability. In total, 1,308 MEC and 784 munitions debris (MD) items, along with numerous other debris, were removed from the surface at a cost of approximately \$5,800,000.
Non-Time Critical Removal Action	2011	An NTCRA was conducted in 2011 to remove MEC within the subsurface ⁵ at the beaches (to a maximum depth of 4 feet) and along roads (to a maximum depth of 2 feet) within UXO 1 (CH2M HILL, 2013). In total, 97 MEC and 792 MD items, along with numerous other debris, were removed from the subsurface at a cost of approximately \$1,400,000.
Remedial Investigation	2011	An RI (CH2M HILL, 2011) was conducted to assess the nature and extent of MEC and environmental media contamination and to assess potential risks to human health and the environment ⁶ at UXO 1. There were no unacceptable risks to human health or the environment posed by environmental contaminant levels identified at the site, so no action is required for environmental media. However, an FS was warranted to address potential explosive hazards associated with the possible presence of MEC in the subsurface, with surface MEC in inaccessible and unstable areas, and from MEC that may become exposed on the surface due to erosion.
Feasibility Study	2012	The FS analyzed remedial alternatives ⁷ to address the potential explosive hazards remaining at UXO 1, in accordance with EPA guidance. A more detailed description of the FS is presented in Section 2.9.

* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for UXO 1. The relevant referenced information is also accessible by the hyperlinks in this document.

2.4 Distribution of Contamination

As noted previously, MEC, MD, and other debris were removed from the surface across UXO 1 and from the subsurface along the beaches and roads. The majority of the munitions-related items were identified in the western portion of the site. MEC was primarily projectiles/mortars (mostly 20-millimeter rounds), but bombs, flares, rockets, and sub-munitions were also identified and removed.

Soil, surface water, and sediment samples were collected and analyzed for explosives and inorganic constituents during the RI to determine if munitions-related contamination had impacted the environmental media (**Figure 4**). No explosives were detected in subsurface soil, surface water, or sediment. Nitrobenzene was the only explosive detected in surface soil (0 – 2 inches) above a screening criterion (soil screening level [SSL]), but in only one sample and between two and three orders of magnitude below risk-based screening criteria for direct exposure (**Table 2**). The SSL is a conservative screening criterion designed to evaluate the potential for chemicals to leach from soil to groundwater above safe drinking water levels. This sample was collected along the boundary between the ECA and LIA and groundwater sampled from a nearby well in the LIA did not contain nitrobenzene. Common inorganic constituents, such as aluminum, copper, iron, and manganese, were detected in soil, surface water, and sediment; however, the concentrations of all inorganics detected were attributable to background of their similarity to the background concentrations, relatively uniform distribution across the site, minor presence in munitions, and/or association with lithology present at UXO 1 (**Table 2**).

FIGURE 4
UXO 1 Sample Location Map

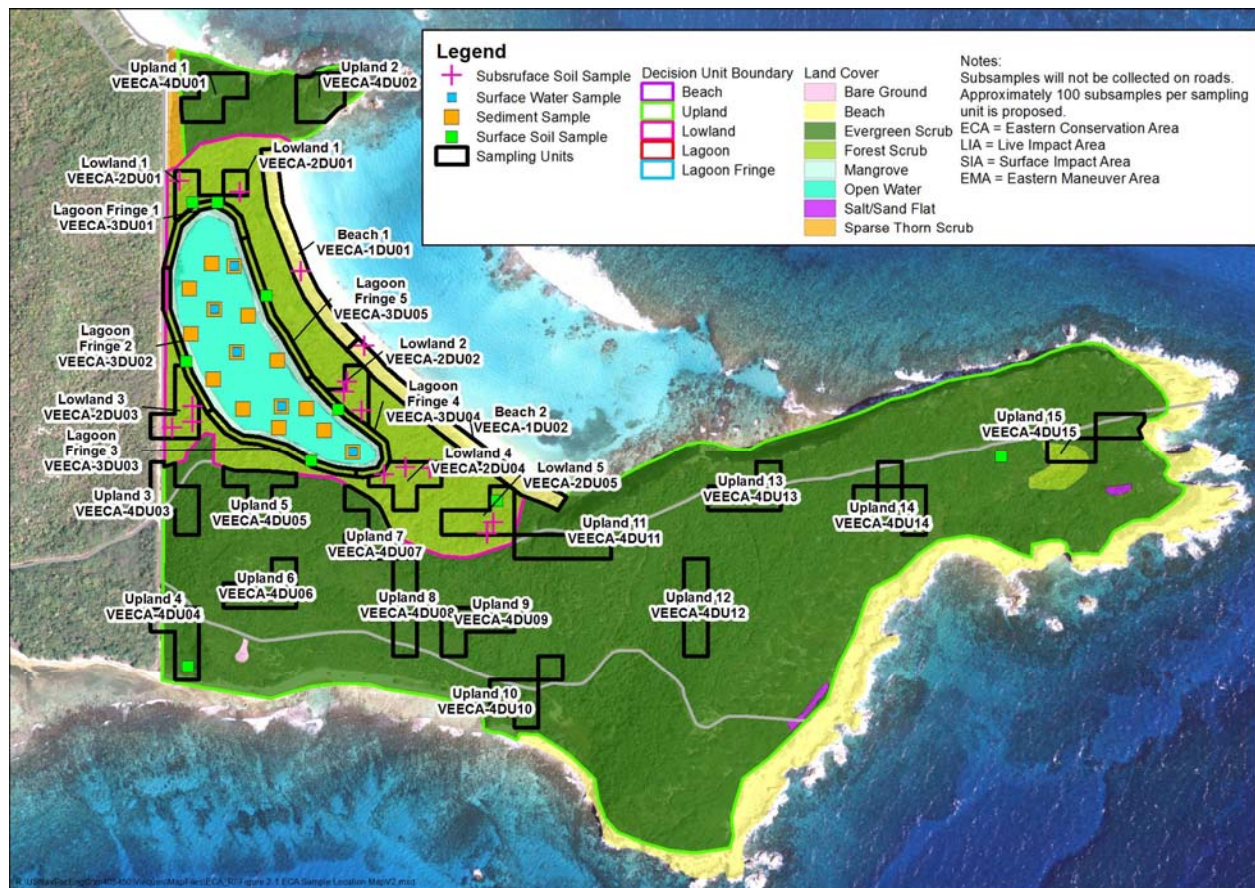


TABLE 2

Remedial Investigation Soil, Surface Water, and Sediment Exceedances for UXO 1

Remedial Investigation Soil, Surface Water, and Sediment Exceedances for CXC 1						
Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria and Background	Vieques (East) Background TL/East Vieques Incremental Background	Screening Criteria ^{2,3}		
				June 2011 Adjusted RSL Industrial Soil	SSL (DAF = 10)	Eco Soil
Soil	Explosives (µg/kg)					
	Nitrobenzene	98 NJ	--	24,000	28	2,260
	Total Metals (mg/kg)					
	Aluminum	36,800 J	35,000/58,200	99,000	1,000,000	--
	Arsenic	71.8	9.17/--	1.6	3.1	-- ¹
	Cadmium	0.46 J	2.36/0.299	80	220	32
	Calcium	324,000	417,000/59,500	--	--	--
	Chromium (hexavalent)	0.067	--/--	5.6	0.0061	--
	Cobalt	19.4	15.8/--	30	5	-- ¹
	Copper	24.8	94.2/24.6	4,100	460	70
	Iron	38,300	38,100/48,900	72,000	6,600	--
	Lead	56.1 J	16/17.2	800	270	120
	Magnesium	16,500	22,200/6,540	--	--	--
	Selenium	2.7	1.3/1.31	510	2.8	0.52
	Sodium	8,570 J	2,250/338	--	--	--
	Thallium	0.27	0.13/--	1.0	1.9	1
	Vanadium	78.8	55.7/--	520	1,800	-- ¹
	Zinc	63.8	32/34.2	31,000	58,000	120
Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria and Background	Background	Screening Criteria ^{2,3}		
				June 2011 Adjusted RSL Tapwater	Eco Marine Surface Water	
Surface Water	Total Metals (µg/L)					
	Arsenic	2 J	--		0.045	1.4
	Chromium	7.5	--		0.043	--
	Cobalt	3.1	--		1.1	--
	Copper	12.1	--		150	3.73
	Iron	2,530	--		2,600	50
	Thallium	0.7 J	--		0.037	21.3
	Dissolved Metals (µg/L)					
	Arsenic, Dissolved	1.1 J	--		0.045	36
	Cobalt, Dissolved	2 J	--		1.1	--
	Copper, Dissolved	10.5	--		150	3.1
Iron, Dissolved	252	--		2,600	50	
Selenium, Dissolved	27 J	--		18	71	
Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria and Background	Background	Screening Criteria ^{2,3}		
				June 2011 Adjusted RSL Industrial Soil	Eco Marine Sediment	
Sediment	Total Inorganics (mg/kg)					
	Aluminum	20,000	--		99,000	18,000
	Arsenic	48.4	--			
	Barium	3.3	--		19,000	48
	Chromium	35.5	--			
	Manganese	571	--		2,300	260
	Selenium	2.7	--		510	1
	Vanadium	62.3	--		520	57

¹ Maximum concentration was detected in subsurface soil; the Vieques Eco SO screening criteria do not apply to subsurface soils.

² Shading indicates screening criterion exceeded. COPCs selected based on exceedance of RSL and/or Eco screening values.

³ The human health and ecological screening criteria were those listed in the Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, 2007), updated as applicable.

COPC = Chemical of Potential Concern

SSL = Soil Screening Level (protection of groundwater)

RSL = Regional Screening Level (human health)

DAF = Dilution Attenuation Factor

Eco = Ecological

2.5 Current and Potential Future Land and Resource Uses

UXO 1 is located on property managed by the DOI that has been designated as the Vieques National Wildlife Refuge. USFWS will perform refuge management activities at the ECA, such as monitoring the sea turtle nesting area along Playa Blanca and planting of native plant species, and the U.S. Coast Guard (USCG) will maintain its navigation “light post” at the eastern end of UXO 1 (**Figure 2**). There is currently no planned public access or groundwater use within UXO 1. Because of the presence of high cliffs and shallow coral reefs surrounding UXO 1, the potential route of access to UXO 1 is through the LIA, as shown in **Figure 2**. However, Public Law 106-398, also referred to as the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, required the LIA to be managed as a wilderness area and to prohibit public access. Therefore, the potential for trespassing at UXO 1 is low.

2.6 Summary of Site Risks

A conceptual site model (CSM) of UXO 1 is provided as **Figure 3**. Potential human health and ecological risks were quantitatively evaluated based on the receptor scenarios and potentially impacted media identified in the CSM. Summaries of the Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) conducted for UXO 1 during the RI are included in the following subsections and in **Table 3**. The HHRA and ERA, which are included in the RI, provide more detailed analysis and evaluation.

TABLE 3
UXO 1 Risk Assessment Results

Media	Human Health Risk
	Current/Future USFWS Workers*
Soil	ELCR = 1×10^{-6} and HI = 0.03 Acceptable
Sediment	ELCR = 7×10^{-8} and HI = 0.0007 Acceptable
Surface Water	ELCR = 2×10^{-8} and HI = 0.002 Acceptable
ELCR – excess lifetime cancer risk HI – hazard index Unacceptable ELCR: $>1 \times 10^{-4}$ Unacceptable HI: >1 *Risk/hazard levels also apply to USCG workers and potential trespassers	
Media	Ecological Risk
	All Receptors
Soil	Acceptable
Sediment	Acceptable
Surface Water	Acceptable

2.6.1 Human Health Risk Assessment

Based on the **CSM⁸**, the HHRA was conducted to evaluate potential human health risks associated with exposure to contaminants detected in soil, sediment, and surface water at UXO 1. Maximum detected concentrations of chemicals were compared to risk-based screening levels, and chemicals of potential concern (COPCs) were identified based on exceedances of these screening levels. Arsenic was the only COPC identified in surface soil and lagoon sediment, and three inorganics (arsenic, cobalt, and thallium) were identified as COPCs in lagoon surface water.

Health risks are based on an estimate of the potential carcinogenic risk and the potential non-cancer hazard, which is expressed as a hazard index (HI). Exposure scenarios evaluated for site media included USFWS workers, since these workers are likely to have the highest potential exposures based on their anticipated work activities and exposure areas during refuge management activities. The health risks

estimated for the USFWS personnel were then used to conservatively estimate potential risks for trespassers and USCG workers, since both of these populations are assumed to have less exposure based on their limited activities and time in the UXO 1 area. Potential exposure pathways comprised ingestion, dermal contact, and/or inhalation of chemicals in soil, surface water, and sediment.

No unacceptable **health risks**⁹ were identified for potential human receptors based on the exposure scenarios listed above; in other words, risk estimates were below threshold values. **Table 3** provides the highest risk and hazard for USFWS workers engaged in: 1) site-wide wildlife surveillance and monitoring, 2) sea turtle monitoring and conservation activities at Playa Blanca, 3) upland dry forest restoration, 4) lowland forest restoration, and 5) lagoon wildlife surveillance and monitoring. For the two types of USFWS workers exposed to more than one environmental medium (those engaging in site-wide wildlife surveillance and monitoring and those engaging in lagoon wildlife surveillance and monitoring), the cumulative risk estimates for exposure to all three media (soil, sediment, and surface water) were also below threshold values.

2.6.2 Ecological Risk Assessment

The ERA was conducted to evaluate potential risks to terrestrial and aquatic ecological receptors exposed to contaminants detected in soil, sediment, and surface water at UXO 1. The site is relatively undisturbed and provides suitable terrestrial habitat for a variety of plant, invertebrate, reptile, bird, and mammal communities. The beach along Bahia Playa Blanca serves as a sea turtle nesting area. At the time of the survey, few species were identified at the lagoon due to its periodically dry nature.

In the terrestrial habitats, concentrations of chemicals in surface soil (incremental and discrete samples) were 1) compared with ecological screening values (ESVs) protective of plants and soil organisms; 2) used in developing dietary doses for comparison to ingestion **toxicity reference values**¹⁰ (TRVs) protective of wildlife; and 3) compared with background soil concentrations. Based on the ecological risk evaluation, selenium and two explosives (1,3,5-trinitrobenzene and 3,5-dinitroaniline) were identified as surface soil COPCs. Following further risk evaluation that considered similarity of concentrations to background (selenium) and low frequency of detection and other relevant TRVs (explosives), none of these chemicals were carried forward as final contaminants of concern (COCs).

The results of the terrestrial food web evaluation identified antimony as a COPC. However, since this result is based on the antimony reporting limit (antimony was not detected), and further evaluation indicated all reporting limits were attributable to background, antimony was not identified as a COC.

No chemicals were identified as COPCs for further risk evaluation in the Lagoon Fringe, Beach, or Upland decision units based upon the deeper discrete surface soil samples.

In the aquatic habitat (lagoon), concentrations of chemicals in surface water and sediment were 1) compared with ESVs protective of aquatic organisms; 2) used in developing dietary doses for comparison to ingestion TRVs protective of aquatic wildlife; and 3) compared with nearby soil concentrations. Copper and iron in surface water, and beryllium, hexavalent chromium, manganese, selenium, and thallium in sediment were identified as COPCs. Further risk evaluation indicated concentrations of these inorganics were attributable to background, and were therefore not identified as COCs.

The results of the aquatic food web evaluation identified selenium as a COPC. Based on further risk evaluation, which considered that selenium in lagoon sediments is not likely elevated above background levels, and refinement of the food web model for selenium uptake into aquatic invertebrates which demonstrated negligible risk to all receptors, selenium was not identified as a COC for aquatic food web exposures at the site.

In summary, no COCs were identified for individual plant and animal receptor exposure to surface soil, surface water, or sediment exposures at UXO 1. Similarly, no COCs were identified for food web exposures. Thus, no unacceptable risks to ecological receptors are present at UXO 1.

2.6.3 Explosive Hazard

As noted previously, interim actions were conducted to remove MEC from the ground surface across the accessible area of UXO 1 and from the subsurface along the roads and beaches. However, potential explosive hazard remains at the site, associated with the possible presence of MEC in the subsurface, with surface MEC in inaccessible and unstable areas, and from MEC that may become exposed on the surface due to erosion.

2.6.4 Basis for Response Action

In cooperation with EPA, PREQB, and USFWS, and in accordance with applicable guidance, the Navy performed interim removal actions and investigations at UXO 1 to evaluate the nature and extent of MEC and associated contamination, to assess the potential risks to human health and the environment posed by that contamination, and to evaluate technologies for their ability to reduce potential explosive hazards remaining at the site. No unacceptable human health or ecological risks were identified from potential exposure to site media. Surface MEC was removed across the vast majority of the site and subsurface MEC was removed from the roads and beach. However, the Navy evaluated remedial alternatives to address potential explosive hazards since there is the potential for MEC to be present in areas where it was not previously removed (e.g., steep cliff areas) or where it may become exposed over time from erosion. Therefore, the Navy developed the response action to reduce potential explosive hazards posed by MEC that may remain at the site.

2.7 Principal Threat Waste

Principal threat wastes are generally considered to be hazardous or highly toxic source materials that result in ongoing contamination to surrounding media, generally cannot be reliably contained, or present a significant risk to human health or the environment should exposure occur. Although remedial action is warranted at UXO 1, based on evaluation of site conditions and the results of human health and ecological risk assessments, there are no wastes that constitute a principal threat at UXO 1.

2.8 Remedial Action Objective

A remedial action objective (RAO) is established based on attainment of regulatory requirements, standards, and guidance; contaminated media; chemicals of concern; potential receptors and exposure scenarios; and human health and ecological risks, as applicable. The following RAOs were developed to be protective of current and potential future receptors, in accordance with the current and intended future land use (i.e., wildlife refuge):

- Lessen the explosive hazards associated with MEC by reducing the potential for uncontrolled human contact with MEC potentially present in site soil and the lagoon.
- Maintain land use that is consistent with the anticipated future use of the site as set forth in the Memorandum of Agreement between the U.S. Department of the Navy and U.S. Department of Interior concerning the transfer of Department of Defense properties on the Eastern End of Vieques (Navy and DOI, 2003). The Memorandum of Agreement sets forth the terms of Public Law 106-398, as amended by Public law 107-107, which require the land containing the ECA to be managed by USFWS as a National Wildlife Refuge.

2.9 Description and Comparative Analysis of Remedial Alternatives

Remedial alternatives were developed based on site-specific considerations related to the potential explosive hazard, site conditions, and planned site use, as detailed in the FS Report (CH2M HILL, 2012).

2.9.1 Description of Remedial Alternatives

The following three remedial alternatives, as summarized in **Table 4** and shown in **Figure 5** (Alternative 2) and **Figure 6** (Alternative 3), were selected for detailed evaluation and comparative analysis:

- Alternative 1 – No Action
- Alternative 2 – Focused Additional MEC Removal and LUCs
- Alternative 3 – Subsurface MEC Removal and LUCs

Consistent with the NCP, a no action alternative was evaluated as a baseline for the comparative analysis. Two additional alternatives were evaluated to meet the RAOs.

2.9.2 Comparative Analysis of Remedial Alternatives

A **comprehensive analysis of each remedial alternative**¹¹ with respect to the **nine evaluation criteria**¹² was completed and is summarized below. **Table 5** depicts a comparison of the alternatives to the criteria to support ranking of the alternatives and Section 4 of the FS Report (CH2M HILL, 2012) provides detailed comparison of the alternatives.

Threshold Criteria

Overall Protection of Human Health and the Environment. Alternative 1 (no action) does not achieve the RAOs. Both of the other alternatives are protective of human health and the environment and reduce the exposure to MEC by controlling land use and access and limiting intrusive activities.

Compliance with Applicable or Relevant and Appropriate Requirements. All alternatives can comply with the **Applicable or Relevant and Appropriate Requirements (ARARs)**¹³ (**Attachment A, Tables A-1 through A-6**). A complete list of the ARARs is included in the UXO 1 FS Report (CH2M HILL, 2012).

TABLE 4
Remedial Alternatives Summary

Alternative	Components	Details	Cost*
1. No Action No action and no restriction on activities.	- N/A	- No action	Total Present-Worth Cost: \$0**
2. Focused Additional MEC Removal and LUCs Manages MEC explosive hazards by ensuring land use remains part of the wildlife refuge and provides protection against direct contact with MEC to USFWS and USCG workers performing maintenance activities through focused additional MEC removal.	<ul style="list-style-type: none"> - MEC removal - Physical demarcation and ICs - LTM and O&M 	<ul style="list-style-type: none"> - Limited MEC removal (e.g., removal of MEC identified during monitoring, subsurface removal of MEC along additional trails to allow access to turtle nesting habitats for monitoring and other management activities). - Vegetation restoration at Playa Blanca and the upland dry forest. Vegetation restoration will be carried out in accordance with a plan developed by USFWS; details of the vegetation restoration will be included in the Remedial Action Work Plan. - Implementing physical demarcation and ICs to maintain land use as wildlife refuge and deter future access by trespassers. This includes installing signage and other boundary demarcation to deter unauthorized access to both the LIA and the ECA. The IC boundary would be surveyed by a professional land surveyor. The LUCs will provide the ability for planned land use and management. - Perform LTM to identify any MEC that becomes exposed at the surface from erosion, observe any indications of trespassing, and repair any damage to boundary demarcation. If MEC is identified, it will be properly disposed. 	Capital Cost: \$511,000 Present Value of Future, Annual O&M Costs: \$1,567,000 Total Present-Worth Cost: \$2,078,000 Assumed timeframe: 30 years

TABLE 4 (continued)
Remedial Alternatives Summary

Alternative	Components	Details	Cost*
3. Subsurface MEC Removal and LUCs Manages MEC explosive hazards by ensuring land use remains part of the wildlife refuge and provides additional protection against direct contact with MEC through subsurface removal.	<ul style="list-style-type: none"> - Subsurface MEC removal - Physical demarcation and ICs - LTM and O&M 	<ul style="list-style-type: none"> - Surface and subsurface MEC removal to a maximum depth of two feet below ground surface (bgs) over the entire area of UXO 1, including the lagoon, with the exception of the steep slopes, cliff edges, and subsurface areas cleared during the NTCRA (i.e., roads and beaches). - Complete vegetation clearance of the entire accessible area of the site and lagoon dewatering (if not dry at the time of remedy implementation) to allow for safe working conditions for subsurface MEC removal. - Vegetation restoration at Playa Blanca and the upland dry forest. Vegetation restoration will be carried out in accordance with a plan developed by USFWS; details of the restoration plan will be included in the Remedial Action Work Plan. - Implementing physical demarcation and ICs to maintain land use as wildlife refuge and deter future access by trespassers. This includes installing signage and other boundary demarcation to deter unauthorized access to both the LIA and the ECA. The IC boundary would be surveyed by a professional land surveyor. The LUCs will provide the ability for planned land use and management. - Perform LTM to identify any MEC that becomes exposed at the surface from erosion, observe any indications of trespassing, and repair any damage to boundary demarcation. If MEC is identified, it will be properly disposed. 	<p>Capital Cost: \$8,979,000</p> <p>Present Value of Future, Annual O&M Costs: \$1,567,000</p> <p>Total Present-Worth Cost: \$10,546,000</p> <p>Assumed timeframe: 30 years</p>

* The TCRA and NTCRA removed a total of 1,405 MEC and 1,576 MD items from UXO 1 for a combined cost of approximately \$7,200,000.

** The No Action alternative in the FS Report included an assumed 30 years of 5-year reviews at a present worth cost of \$184,000.

FIGURE 5

Conceptual Layout of Alternative 2 – Focused Additional MEC Removal and LUCs

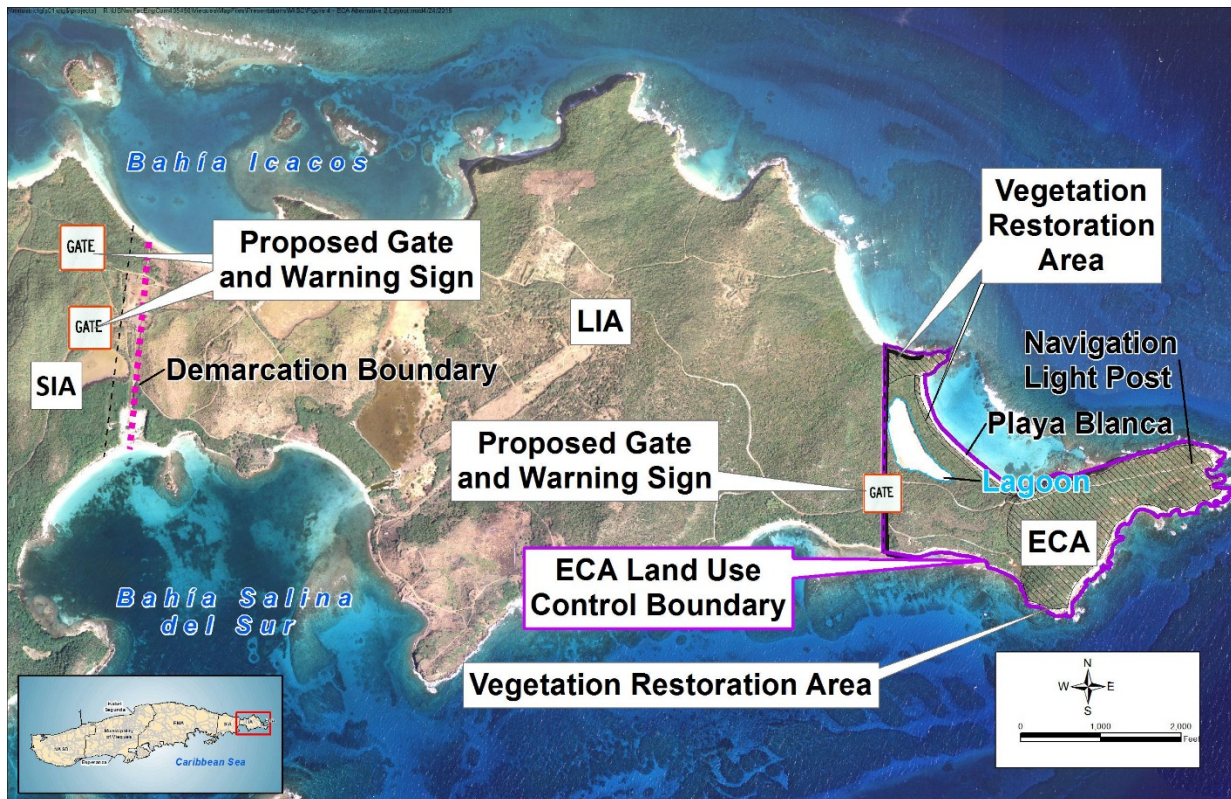


FIGURE 6

Conceptual Layout of Alternative 3 – Subsurface MEC Removal and LUCs

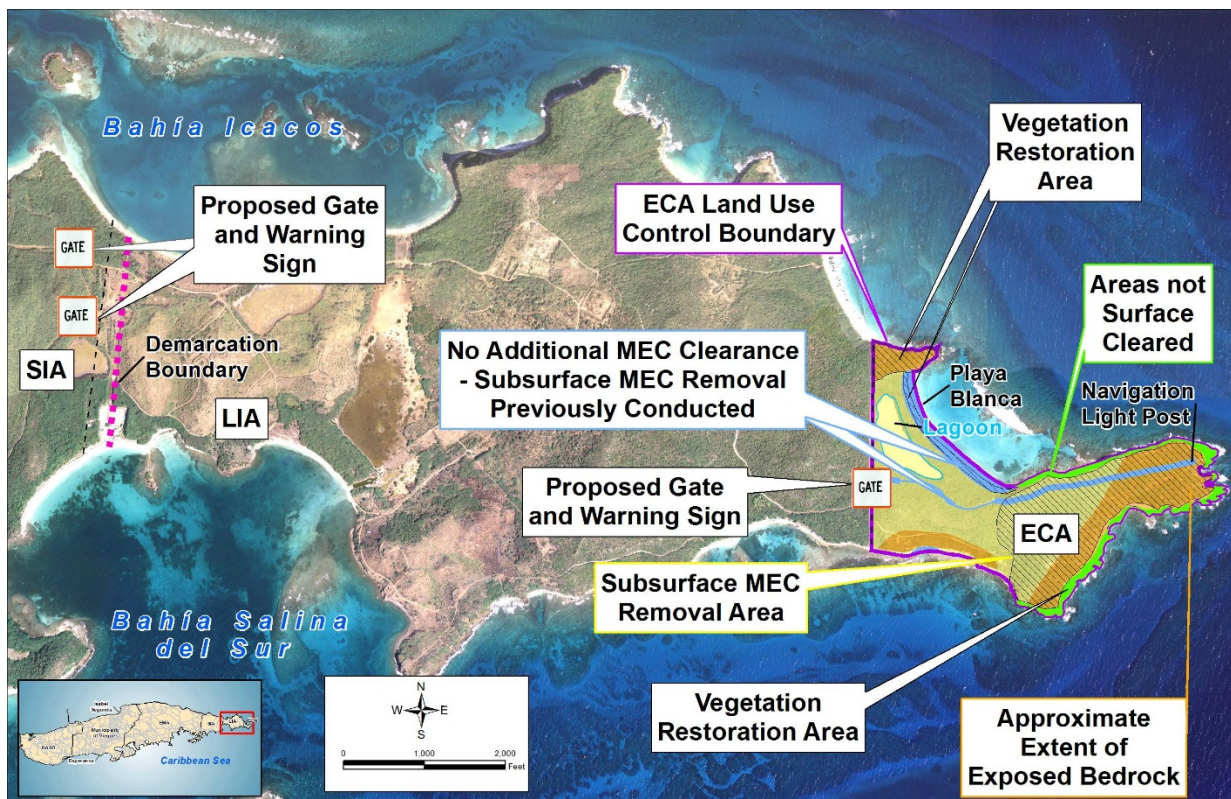








































































TABLE 5
Comparative Analysis of Remedial Alternatives

Criterion ¹	Alternative 1	Alternative 2	Alternative 3
	No Action	Focused Additional MEC Removal and LUCs	Subsurface MEC Removal and LUCs
Threshold Criterion			
Overall Protection of Human Health and the Environment			
Compliance with ARARs			
Compliance with Chemical-Specific ARARs			
Compliance with Action-Specific ARARs			
Compliance with Location-Specific ARARs			
Balancing Criterion			
Long-Term Effectiveness and Permanence			
Magnitude of Residual Risk			
Adequacy and Reliability of Controls			
Reduction of Toxicity, Mobility, or Volume Through Treatment			
Treatment Process Used and Materials Treated			
Amount of Hazardous Materials Destroyed or Treated	Not Applicable		
Degree of Expected Reductions in Toxicity, Mobility, and Volume	Not Applicable		
Degree to Which Treatment is Irreversible	Not Applicable		
Type and Quantity of Residual Remaining After Treatment	Not Applicable		
Short-Term Effectiveness			
Protection of Community During Remedial Actions			
Protection of Workers During Remedial Actions			
Environmental Impacts			
Time Until Remedial Action Objectives are Achieved			
Implementability			
Technical Feasibility			
Administrative Feasibility			
Availability of Services, Equipment, and Materials			
Cost (Total Present Value)	\$0	\$2,078,000	\$10,546,000

Individual criterion scores:  not met  poor  satisfactory  good  excellent

¹ Details of the comparative analysis can be found in Section 4 of the FS Report (CH2M HILL, 2012).

Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Each of the alternatives, with the exception of Alternative 1, is expected to achieve long-term effectiveness and permanence. A significant reduction in explosive hazards has already resulted from the interim removal actions. Further hazard reduction would be achieved by minimizing uncontrolled exposure to MEC by the LUCs, and implementing LTM to confirm the remedy effectiveness and identify changes in site conditions. It is not anticipated that Alternative 3 would significantly alter the explosive hazard relative to Alternative 2 since areas with the highest likelihood of access (roads and beaches) have already been cleared. Neither Alternative 2 nor Alternative 3 would significantly increase the long-term effectiveness since MEC associated with the most accessible areas has already been removed.

Reduction in Toxicity, Mobility, or Volume through Treatment. Alternative 1 does not result in any reduction of toxicity, mobility, or volume (TMV) by treatment. Alternative 2 would result in additional reduction of TMV by MEC removal, if MEC is identified during site inspections or if clearance of additional pathways for USFWS workers is necessary. Alternative 3 would reduce TMV through removal and detonation of subsurface MEC (down to a maximum of two feet bgs) from the entire accessible area of the site not previously addressed through the interim removal actions and where bedrock is not exposed at the surface.

Short-Term Effectiveness. Alternatives 2 and 3 achieve the RAOs within approximately six months by controlling potential explosive hazards with implementation of LUCs and LTM. As part of the short-term effectiveness evaluation, a sustainability analysis was conducted for each of the three remedial alternatives. Sustainability is focused on energy conservation, reduction of greenhouse gases, waste minimization, and re-use and recycling of materials. Alternative 1 has no short-term construction impacts and the lowest environmental footprint since there would be no remedial construction activities. The other alternatives would include construction activities with varying levels of potential impacts to construction workers, the community, and the environment. The amount of impact is proportional to the amount of vegetation clearance, number of detonations and removal, and truck traffic through the community. Alternative 2 has limited impacts to the landscape due to vegetation clearing for boundary demarcation. Alternative 3 has significant temporary disturbance of land during construction activities (i.e., significant vegetation clearance, MEC clearance, lagoon dewatering, erosion control, and re-vegetation). Alternative 3 has the highest greenhouse gas emissions. In addition, Alternative 3 has the highest safety hazard for construction workers due to the significantly higher potential to be in contact with MEC.

Implementability. Alternative 1 would not obtain administrative approval since it does not meet the RAOs. Alternative 3 would be the most complex alternative to implement because of the large scale of vegetation removal and MEC clearance and because removing all MEC is not technically practical.

Cost. Alternative 1 is the most cost effective, but does not meet the RAOs. Alternative 2 meets the RAOs and has a **present-worth cost**¹⁴ of \$2,078,000, which is substantially lower than Alternative 3. Alternative 3 is the least-cost effective alternative, with an estimated present-worth cost of \$10,546,000.

Modifying Criteria

Commonwealth Acceptance. Commonwealth involvement has been continual throughout the CERCLA process for UXO 1, and PREQB concurs with the selected remedy.

Community Acceptance. The Proposed Plan was issued for public review from July 30 to September 12, 2014 and was discussed at a public meeting on August 21, 2014. Several clarifying questions were asked and addressed at the meeting; no other public comments on the Proposed Plan were received.

2.10 Selected Remedy

The selected remedy for UXO 1 is Alternative 2, Focused Additional MEC Removal and LUCs. This selected remedy is the preferred alternative that was presented in the Proposed Plan.

2.10.1 Rationale for Selected Remedy

Based on the evaluation of the data, information currently available, and the comparative analysis, the Navy and EPA, with concurrence of PREQB and DOI, determine the selected remedy meets the statutory requirements of CERCLA for protection of human health and the environment under current and projected future land use as a wildlife refuge.

2.10.2 Description of Selected Remedy

Because interim removal actions previously removed MEC from the surface throughout the majority of UXO 1 and from the subsurface along the roads and beaches, Alternative 2 focuses primarily on using LUCs. The LUC objective is to reduce exposure to potentially remaining explosive hazards and includes engineering controls (i.e., physical barriers), ICs, and monitoring to evaluate the LUC effectiveness and identify changes in site conditions that may increase explosive hazards. Alternative 2 also includes limited MEC removal (e.g., removal of any MEC identified during monitoring, subsurface removal of MEC along additional trails to allow USFWS to gain access to turtle nesting habitats). Alternative 2 also includes vegetative restoration at Playa Blanca and the dry upland forest. The details of Alternative 2 are provided in **Table 4**.

2.10.3 Expected Outcomes of the Selected Remedy

The expected outcome of the selected remedy is that the RAOs for UXO 1 will be met, but that potential explosive hazards will remain at the site indefinitely that will require LUCs and associated LTM.

Within 90 days following signature of the ROD, the Navy will prepare, in accordance with EPA guidance, and submit to EPA, PREQB, USFWS, and Puerto Rico Department of Natural and Environmental Resources (PRDNER) for review and concurrence, a Remedial Action Work Plan that includes an LUC Plan, LTM Plan, and a plan for limited MEC removal (from trails identified prior to remedy implementation or exposed by future erosion). Details of the LUCs, including performance metrics, will be included in the LUC Plan. While potential explosive hazards are present, the Navy is responsible for implementing, maintaining, inspecting, reporting on, and enforcing the LUCs in accordance with the ROD and associated LUC Plan.

2.10.4 Statutory Determinations

In accordance with the NCP, the selected remedy meets the following statutory determinations.

- **Protection of Human Health and the Environment** - The selected remedy is protective of human health and the environment by controlling land use and limiting intrusive activities through ICs and by performing limited additional MEC removal.
- **Compliance with ARARs** - The selected remedy will attain the Federal and Commonwealth ARARs presented herein (**Attachment A, Tables A-1 through A-6**).
- **Cost-Effectiveness** - The selected remedy provides the best value relative to the cost.
- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** - The selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be used in a practicable manner at UXO 1. Because interim actions have already removed MEC on the ground surface across UXO 1 and from the subsurface of roads and beaches, LUCs and limited additional MEC removal will attain the RAOs.

- **Preference for Treatment as a Principal Element** – The selected remedy does have some reduction in toxicity, mobility, or volume of treatment through limited subsurface MEC removal and treatment (detonation). Additionally, a significant reduction in volume of MEC occurred at the site during the previous removal actions (**Table 1**) and is factored into this overall evaluation.
- **Five-Year Review Requirements** – The Navy will maintain ICs and conduct a statutory remedy review every five years to ensure that the remedy continues to provide adequate protection of human health and the environment. If the remedy is determined not to be protective of human health and the environment because, for example, ICs have failed, then additional ICs and/or remedial actions will be evaluated by the Navy, EPA, USFWS, and PREQB for potential implementation.

2.11 Community Participation

The Navy, in consultation with the EPA, PREQB, and USFWS, established a community relations program for the Vieques Environmental Restoration Program in 2001. The program promotes communication regarding site investigations and remediation activities between the stakeholder agencies (Navy, EPA, PREQB, and USFWS) and the public. The community relations program formed a Restoration Advisory Board (RAB) in 2004 to encourage community involvement. RAB meetings are held approximately every three months and are open to the public for participation. A summary of the community participation efforts by the stakeholder agencies for this action are discussed in the next section.

3 Responsiveness Summary

The Responsiveness Summary is a concise summary of substantive comments received from the public during the public comment period and the associated responses. The Responsiveness Summary was prepared in accordance with guidance in *Community Relations in Superfund: A Handbook* (EPA, 1992) after the public comment period ended on September 12, 2014.

3.1 Overview

The Proposed Plan presented to the public identified that a remedial action, consisting of Focused Additional MEC Removal and LUCs, is warranted at UXO 1 to protect human health and the environment.

3.2 Community Involvement Process

In accordance with Section 117(a) of CERCLA, the Navy provided a public comment period between July 30, 2014 and September 12, 2014, for the UXO 1 Proposed Plan. A **public meeting**¹⁵ was held on August 21, 2014 at the Vieques Multiple Use Center, located at Isabel Segunda, Vieques, Puerto Rico to present information pertinent to the proposed remedial action determination and to accept comments and questions regarding this determination. No formal comments or questions were submitted to the Navy, EPA, or PREQB during the public meeting.

The Proposed Plan and previous investigation reports for UXO 1 were available during the public comment period and are currently available in the former VNTR Administrative Record. The Administrative Record is accessible to the public via:

<http://www.navfac.navy.mil/vieques>

3.3 Summary of the Public Comment Period

No community members expressed opposition to the proposed remedial action determination for UXO 1. No comments or questions were received by the Navy, EPA, USFWS, or PREQB during the public comment period.



Acronyms

4 Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	contaminant of concern
COPC	chemical of potential concern
CSM	conceptual site model
DOI	Department of Interior
ECA	Eastern Conservation Area
eco-SSL	ecological soil screening level
ELCR	excess lifetime cancer risk
EMA	Eastern Maneuver Area
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ERA/SI	Expanded Range Assessment/Site Inspection
ESV	ecological screening value
FFA	Federal Facilities Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
ft msl	feet above mean sea level
HHRA	Human Health Risk Assessment
HI	hazard index
IC	institutional control
LIA	Live Impact Area
LIDAR	light detection and radar
LTM	long-term monitoring
LUC	land use control
µg/L	micrograms per liter
mg/L	milligrams per liter
MD	munitions debris
MEC	munitions and explosives of concern
MRP	Munitions Response Program

4 ACRONYMS

NASD	Naval Ammunition Support Detachment
NAVFAC	Naval Facilities Engineering Command
Navy	United States Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-Time Critical Removal Action
O&M	operation and maintenance
OB/OD	open burning/open detonation
OU	operable unit
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PREQB	Puerto Rico Environmental Quality Board
RAB	Restoration Advisory Board
RAO	remedial action objective
RI	Remedial Investigation
ROD	Record of Decision
RSL	regional screening level
SIA	Surface Impact Area
SMP	Site Management Plan
SSL	soil screening level
TCRA	Time Critical Removal Action
TMV	toxicity, mobility, or volume
TRV	toxicity reference value
U.S.	United States
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VNTR	Vieques Naval Training Range



References

5 References

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
Ref. 1	Environmental Baseline Survey	Section 2.3	Naval Facilities Engineering Command (NAVFAC), 2003. <i>Draft Final Environmental Baseline Survey, Vieques Naval Training Range, Vieques Island, Puerto Rico. April.</i>
Ref. 2	Preliminary Range Assessment	Section 2.3	CH2M HILL, 2003. <i>Final Draft Preliminary Range Assessment Report, Vieques Naval Training Range, Vieques Island, Puerto Rico. April.</i>
Ref. 3	Identification of munitions	Section 2.3	CH2M HILL, 2010. <i>Final Expanded Range Assessment/Site Inspection Report, Former Vieques Naval Training Range, Vieques, Puerto Rico. September. Section 4.</i>
Ref. 4	TCRA	Section 2.3	CH2M HILL, 2010. <i>Status Report, Time Critical Removal Action, Interim Action For the Removal of Surface Munitions and Explosives of Concern at Munitions Response Areas-Live Impact Area, and Eastern Conservation Area, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico. October.</i>
Ref. 5	MEC within the subsurface	Section 2.3	CH2M HILL, 2013. <i>Final Status Report, Non-Time Critical Removal Action, Subsurface Munitions and Explosives of Concern, UXO 1, Eastern Conservation Area, Atlantic Fleet Weapons Training Area-Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico. February. Section 5.</i>
Ref. 6	assess potential risks to human health and the environment	Section 2.3	CH2M HILL, 2012. <i>Final Remedial Investigation Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, July. Sections 7 and 8.</i>
Ref. 7	remedial alternatives	Section 2.3	CH2M HILL, 2012. <i>Final Focused Feasibility Study Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, October. Section 3.</i>
Ref. 8	CSM	Section 2.6.1	CH2M HILL, 2012. <i>Final Remedial Investigation Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, July. Appendix K, Figure 1.</i>

5 REFERENCES

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record
Ref. 9	health risks	Section 2.6.1	CH2M HILL, 2012. <i>Final Remedial Investigation Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, July.</i> Appendix K.
Ref. 10	toxicity reference values	Section 2.6.2	CH2M HILL, 2012. <i>Final Remedial Investigation Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, July.</i> Appendix L, Tables L-22 and L-23.
Ref. 11	comprehensive analysis of each remedial alternative	Section 2.9.2	CH2M HILL, 2012. <i>Final Focused Feasibility Study Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, October.</i> Section 4.2 and 4.3, Table 4-1.
Ref. 12	nine evaluation criteria	Section 2.9.2	CH2M HILL, 2012. <i>Final Focused Feasibility Study Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, October.</i> Section 4.1.
Ref. 13	Applicable or Relevant and Appropriate Requirements (ARARs)	Section 2.9.2	CH2M HILL, 2012. <i>Final Focused Feasibility Study Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, October.</i> Tables A-1 through A-6.
Ref. 14	present-worth cost	Section 2.9.2	CH2M HILL, 2012. <i>Final Focused Feasibility Study Report, UXO 1, Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico, October.</i> Table 4-2.
Ref. 15	public meeting	Section 3.2	Transcript of the Public Hearing for the Meeting of Proposed Plans for UXO 1. <i>Eastern Conservation Area, Former Vieques Naval Training Range, Vieques, Puerto Rico.</i> August 21, 2014.

Attachment A
Applicable or Relevant and Appropriate Requirements

TABLE A-1

Federal Chemical-Specific ARARs*Feasibility Study Report**UXO 1, Eastern Conservation Area**Former Vieques Naval Training Range**Vieques, Puerto Rico*

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Federal Chemical-Specific ARARs apply.						

TABLE A-2

Puerto Rico Chemical-Specific ARARs*Feasibility Study Report**UXO 1, Eastern Conservation Area**Former Vieques Naval Training Range**Vieques, Puerto Rico*

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Puerto Rico Chemical-Specific ARARs apply.						

Table A-3

Federal Location-Specific ARARs*Feasibility Study Report**UXO 1, Eastern Conservation Area**Former Vieques Naval Training Range**Vieques, Puerto Rico*

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Coastal Zone Management Act						
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal zone management programs. Federal agencies must supply the State with a consistency determination.	Activity taking place in a wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone.	15 CFR 930.33(a)(1), (a)(2), (b); .35(a), (b); .36(a)	All	Applicable	Activities at UXO 1 that will affect Puerto Rico's coastal zone will be consistent to the maximum extent practicable with Puerto Rico's enforceable policies. Activities performed on-site and in compliance with CERCLA are not subject to administrative review; however, the substantive requirements of making a consistency determination will be met.
Migratory Bird Treaty Act						
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	Migratory Bird Treaty Act, 16 USC 703	All	Applicable	The site is located in the Atlantic Americas Migratory Flyway. If migratory birds, or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs.
Endangered Species Act 1978						
Endangered Species	Actions to protect endangered or threatened species and prevent adversely impacting critical habitat.	Presence of protected species or their critical habitat	16 USC 1538(a)(1)(B)	All	Applicable	Several endangered species and critical habitat have been identified at UXO1. If protected species are present at the site during the response action, steps will be taken to prevent adverse impacts. Activities will avoid identified critical habitat areas or, if they cannot be avoided, actions resulting in permanent impact will be avoided.
Archaeological Resources Protection Act of 1979						
Locations of Archaeological Significance	Provides for the preservation of historically and archaeologically significant artifacts.	Applies to archaeological sites and artifacts.	16 USC 470ee(a)	All	Applicable	Archaeological sites have been identified within the UXO1 boundary. Activities will avoid these sites to the maximum extent practical. Activities performed on-site and in compliance with CERCLA are not subject to permits or administrative review; however, the substantive requirements of a permit to disturb these sites will be met if they cannot be avoided.

Table A-4

Puerto Rico Location-Specific ARARs

Feasibility Study Report

UXO 1, Eastern Conservation Area

Former Vieques Naval Training Range

Vieques, Puerto Rico

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Puerto Rico Location-Specific ARARs apply.						

Table A-5

Federal Action-Specific ARARs*Feasibility Study Report**UXO 1, Eastern Conservation Area**Former Vieques Naval Training Range**Vieques, Puerto Rico*

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Performing activities that will disturb greater than one acre of land	Requires the development and implementation of best management practices and erosion and sedimentation control measures during construction activity.	Implementation of construction activities that will disturb more than one acre of land	one to five acres: 40 CFR 122.26(a)(1)(ii), (a) (9)(i)(b), (b)(15); 122.44(k)(2) and (s)(1) five acres or more: 40 CFR 122.26(a)(1)(ii), (a)(9)(i)(b), (b)(14)(x); 122.44(k)(2) and (s)(2)	2, 3	Applicable	If the selected remedy disturbs greater than one acre of land a Storm Water Pollution Prevention Plan will be prepared and implemented. Since activities are taking place on site and in compliance with CERCLA, the substantive requirements will be met, but a permit will not be required.
Management of military munitions	Specifies management requirements for those military munitions that are no longer exempt from the definition of solid waste	Management of unused military munitions that have been disposed of or fired/used military munitions that have been removed from the range.	40 CFR 266.202(b) and (c) ; 205 (a) and (b)	2, 3	Applicable	If any military munitions lose their exemption from the definition of solid waste they will be handled in accordance with these rules.

Table A-6

Puerto Rico Action-Specific ARARs*Feasibility Study Report**UXO 1, Eastern Conservation Area**Former Vieques Naval Training Range**Vieques, Puerto Rico*

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Land disturbance	A Control of Erosion and Sediment (CES) Plan and a Work Plan must be prepared for any activities that involve the alteration of ground or soil conditions that have not been specifically excluded.	Disturbance of more than 40 cubic meters of soil during construction activity	Puerto Rico Regulation 5754.1230(B), (C)	2, 3	Applicable	Remedial alternatives involve the disturbance of more than 40 cubic meters of soil. A CES and Work Plan will be prepared for this activity.
Production of Fugitive Dust	Dust control measures must be implemented during construction activities to prevent emissions beyond the property boundary. These include, but are not limited to, the use of water or other chemicals on road ways to control dust, covering haul trucks, and cleaning tracked soil off of paved roads.	Construction activity causing particulate matter to become airborne	Puerto Rico Regulation 5300.404(A)(2), (4), (7); (B)	2, 3	Applicable	Applicable to activities that produce fugitive dust. Dust control measures will be implemented.
Performing construction activities that generate noise	No construction activity may be performed at night or in such a way that vibrations are produced that can be felt beyond the property boundary. If equipment used in construction is not manufactured in accordance with USEPA standards for newly manufactured equipment then it may not produce noise that exceeds 70 dBA.	Construction activity including earthwork	Puerto Rico Regulation 3418.26	2, 3	Applicable	The site is considered to be in Zone II (Commercial) for noise production. Noise pollution during MEC clearance and demolition, dewatering, and earthwork activities will be prevented.
Management of non-hazardous solid waste onsite in containers and piles	Non-hazardous solid waste staged onsite must not create a hazard or public nuisance.	Generation of non-hazardous solid waste that is managed onsite in containers or in piles.	Puerto Rico Non-Hazardous Solid Waste Regulation 531.H	2, 3	Applicable	It is anticipated that non-hazardous solid wastes will be generated during the implementation of these alternatives. IDW will be sampled to confirm characterization prior to disposal. It will be assumed that MDAS is regulated as scrap metal.
Surface water discharge	Sets surface water standards for receiving waters.	Discharging of surface water from the lagoon to adjacent surface water body	Rule 1303C, 1303.1A, B, D, E, and H	3	Applicable	Applicable to surface water discharges associated with dewatering the lagoon. Investigation did not identify COCs in surface water; therefore, it is assumed that existing concentrations of any substances are equivalent to background and further testing is not required.